

# Application of Flipped Classroom Combined with PBL Teaching Method in the Teaching of Respiratory Intensive Care Unit Nursing

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**Abstract:** *Objective:* The aim is to investigate the application effect of flipped classroom combined with problem-based learning (PBL) teaching method in the teaching of respiratory intensive care unit nursing. *Methods:* 100 fresh nursing students who were interned in the respiratory intensive care unit of our hospital from June 2020 to May 2022 were selected and randomly divided into 50 students in the control group and 50 students in the experimental group. The students in the control group were taught by PBL teaching method, and the students in the experimental group were taught by flipped classroom combined with PBL teaching method. After the completion of the teaching, the teachers combined the performance of the two groups of students, and scored them comprehensively in terms of their professional theoretical knowledge, clinical operation skills, independent learning ability, and teamwork ability, and carried out a survey of the experimental group's students in terms of their satisfaction with the understanding of theoretical knowledge, clinical operation, independent learning ability, teamwork ability, and other dimensions. *Results:* There was no statistical significance in the specialized theoretical knowledge scores of the two groups of students ( $P > 0.05$ ). The scores of clinical operation, independent learning ability, and teamwork ability of the two groups of students were statistically significant ( $P < 0.05$ ), and all the scores of the students in the experimental group were higher than that of the control group. More than 90% of the students believed that the flipped classroom combined with PBL teaching method could assist in the comprehension of theoretical knowledge, improve the clinical operation skills, enhance the ability of independent learning and teamwork; there were 92% of the students supported the use of flipped classroom combined with PBL teaching in respiratory intensive care unit nursing teaching. *Conclusion:* In the teaching of respiratory intensive care unit nursing, the use of flipped classroom combined with PBL teaching method can improve the learning effect of students, and has certain value in teaching.

**Keywords:** Flipped classroom; PBL teaching method; Respiratory intensive care unit; Nursing teaching; Application effect; Medical education

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## 1. Introduction

Respiratory Intensive Care Unit (RICU) is an important department in hospitals, which plays an important role

in receiving and treating patients with respiratory critical illnesses<sup>[1]</sup>. However, due to the complex and rapidly changing conditions of patients in the RICU, there are high requirements for the professionalism and clinical skills of healthcare professionals. Therefore, the improvement of the quality of nursing teaching in respiratory intensive care unit and the methods to help students to better master the clinical skills have become important issues in current medical education. In the traditional medical teaching mode, teachers usually adopt the lecture-based learning (LBL) teaching method. However, this teaching method, which is mainly based on knowledge lecturing, is likely to lead to a series of problems such as students' low learning initiative, poor hands-on skills, and limited innovative thinking<sup>[2-4]</sup>. Therefore, there is a need to find a new teaching method to improve the effectiveness of nursing teaching in respiratory intensive care unit. As a result, the flipped classroom and problem-based learning (PBL) teaching method began to come into the public's view, which has been widely used in the field of medical education and achieved good results<sup>[5,6]</sup>.

The purpose of this paper is to discuss the application effect of flipped classroom combined with PBL teaching method in the teaching of respiratory intensive care unit nursing, with a view to improving the teaching quality of intensive care unit nursing.

## **2. Methodology**

### **2.1. General information**

One hundred fresh nursing students who came to our hospital for internship in the respiratory intensive care unit from June 2020 to May 2022 were selected, and randomly divided into the experimental group and the control group, with 50 students in each group. Among them, there were 8 male and 42 female students in the experimental group, with an average age of  $20.22 \pm 3.15$ ; there were 6 male and 44 female students in the control group, with an average age of  $20.24 \pm 3.29$ . The differences between the two groups of students in terms of gender, average age, and academic system were not statistically significant.

### **2.2. Teaching methods**

Combined with the teaching objectives and the arrangements of our hospital, the two groups of students adopted different teaching methods.

The students in the control group adopted PBL teaching method. The students were divided into 5 groups of 10 students each, and firstly, the teacher set some specific questions for respiratory intensive care unit nursing, such as "A 55-year-old female patient with severe pneumonia, who has symptoms of respiratory failure, how should you assess her condition as a nurse?" and "What nursing actions can you do as a nurse to address the patient's state of respiratory failure?" Students searched for answers to form group opinions through self-study, review of relevant literature, and group discussion. Subsequently, a classroom discussion was held to discuss and share the answers among the groups. Thereafter, the teacher made comments on the content of the speech in each group, pointed out the shortcomings and strengths, and provided accurate answers and related knowledge.

The experimental group adopted flipped classroom combined with PBL teaching method. Firstly, the teacher prepared relevant cases, situations, simulation equipment, and other teaching resources in advance, and determined one or more topics, such as "prevention and care of respiratory failure in patients with severe pneumonia." Students sought answers to their questions outside the classroom through self-study, review of relevant literature<sup>[7]</sup>, group discussions, etc., and summarized the new knowledge learned during the independent learning process by making PowerPoint presentations or reports. Subsequently, students acted as "little teachers" and shared the results of independent learning through presentations, demonstrations, group

discussions, and so on. The teacher acted as a facilitator in encouraging students to ask questions and guiding them to think deeply about the issues. At the end of the classroom discussion, the teacher made a concise speech according to the students' performance, emphasizing the key points and difficulties. At the same time, the teacher introduced some latest research results and clinical practice experience to broaden students' horizons. Lastly, clinical practice was carried out to allow students to understand how to take care of patients with severe pneumonia when they have respiratory failure.

### 2.3. Evaluation of teaching effect

The indicators below were evaluated.

- (1) Achievement assessment: combined with the performance of the two groups of students, the teacher scored comprehensively from the professional theoretical knowledge (25 points), clinical operation skills (30 points), independent learning ability (25 points), teamwork ability (20 points), and the total score was 100 points.
- (2) Questionnaire survey: for the teaching effect of the flipped classroom combined with PBL teaching method, the students in the experimental group were surveyed for their satisfaction from the dimensions of understanding of theoretical knowledge, clinical operation ability, independent learning ability, teamwork ability, and support for the flipped classroom combined with PBL teaching method, with "yes" being satisfied and "no" being dissatisfied.

### 2.4. Statistical methods

SPSS20.0 statistical analysis software was applied, and the measurements that conformed to normal distribution were expressed as mean  $\pm$  standard deviation (SD), and the comparison between the two groups was made by *t*-test.  $P < 0.05$  indicated that the difference was statistically significant.

## 3. Results

### 3.1. Comparison of the comprehensive examination scores of students in the two groups

Both groups of students passed the respiratory intensive care unit nursing theory examination and completed the clinical internship course, and their scores were real and valid. By comparing the scores of the two groups of students, it was found that there was no statistical significance in the theoretical knowledge of the two groups of students ( $P > 0.05$ ); the scores of the two groups of students in clinical operation ability, independent learning ability, and teamwork ability were statistically significant ( $P < 0.05$ ), and the scores of the students in the experimental group were higher than the scores of the control group, as shown in **Table 1**.

**Table 1.** Comprehensive achievement scores of the two groups of students

Group	Specialized theoretical knowledge results (25 points)	Clinical skills (30 points)	Self-learning ability (25 points)	Teamwork ability (20 points)	Total score (100 points)
Control group (n = 50)	22.06 $\pm$ 1.21	23.18 $\pm$ 1.34	16.35 $\pm$ 1.69	15.26 $\pm$ 1.35	80.39 $\pm$ 1.51
Experimental group (n = 50)	22.15 $\pm$ 1.25	26.35 $\pm$ 1.39	22.37 $\pm$ 2.03	17.55 $\pm$ 1.22	90.35 $\pm$ 1.47
<i>t</i> -value	0.365	11.610	16.116	8.899	33.420
<i>P</i> value	0.715	0.000	0.000	0.000	0.000

### 3.2. Questionnaire survey results

After completing the teaching, a questionnaire survey was conducted on 50 students in the experimental group, and 50 valid questionnaires were cumulatively retrieved. The results of the questionnaire showed that more than 90% of the students believed that the flipped classroom combined with PBL teaching method could assist in the understanding of theoretical knowledge, improve the clinical operation ability, enhance the ability of independent learning and teamwork; 92% of the students supported the flipped classroom combined with PBL teaching in the RICU nursing teaching, as shown in **Table 2**.

**Table 2.** Analysis of the results of the questionnaire in the experimental group

Content of the survey	Yes	No	Percentage (100%)
Whether it can assist theoretical knowledge understanding	50	0	100%
Whether it can improve clinical operation ability	48	2	96%
Whether it can improve independent learning ability	47	3	94%
Whether it can enhance teamwork ability	49	1	98%
Whether to support the use of flipped classroom and PBL teaching method in the teaching of respiratory intensive care unit nursing	46	4	92%
Total	240	10	96%

## 4. Discussion

RICU mainly admits and treats patients suffering from various severe respiratory diseases, with common conditions such as dyspnea, respiratory failure, acute respiratory distress syndrome (ARDS), respiratory infections, asthma attacks, pneumothorax, and pulmonary embolism. Higher requirements are put forward for nursing staff <sup>[8,9]</sup>, who are mainly responsible for monitoring patients' vital signs, conducting respiratory care, mechanical ventilation care, providing nutritional support, infection prevention and control, psychological guidance, rehabilitation training, and other work, which play an important role in the process of patients' recovery.

Flipped classroom originated in the 1990s and began to be popularized along with the continuous development of the Internet and digital technology, and it was introduced to China after the 21st century, and has been widely implemented, which is a relatively novel means of teaching <sup>[10-12]</sup>.

Flipped classroom is a teaching mode that readjusts the time inside and outside the classroom and transfers the decision of learning from teachers to students. In this model, students pre-learn the course content outside the classroom through online learning, reading literature, watching videos, etc., while in the classroom, students mainly devote their energy to interacting with the instructor and peers to further deepen and expand their knowledge. This model can strengthen students' mastery of nursing-related theoretical knowledge and improve their motivation for learning <sup>[13]</sup>.

Problem-based learning (PBL) originated in the 1960s <sup>[14]</sup> and expanded from the field of medical education, nowadays it has been developed in various disciplines. PBL is a problem-oriented teaching method that emphasizes students' acquisition of knowledge and skills through independent learning, cooperative learning, and critical thinking in the process of solving real-world problems.

The use of the flipped classroom, which focuses on independent learning, in conjunction with the problem-oriented PBL teaching method in nursing teaching has great application value. For example, Yang *et al.* <sup>[15]</sup> analyzed the nursing knowledge, attitude, and practice (KAP) of nurses in the internship period between the conventional teaching group and the flipped classroom combined with PBL teaching group, and found that the

group that used the flipped classroom combined with PBL teaching method scored significantly better than the conventional teaching group in the KAP knowledge dimension, the current status of adherence dimension, and the nursing behavior dimension.

Tang <sup>[16]</sup> also found through comparative analysis that adopting the flipped classroom combined with PBL teaching method can significantly improve the theoretical knowledge assessment scores, practical operation assessment scores, and average assessment scores of nurses at the end of internship. This is consistent with the findings of this paper, which adopted the flipped classroom combined with PBL teaching method for the experimental group of students in intensive care unit nursing teaching, and found that, compared with the students in the control group that simply adopted the PBL teaching method, the scores of their clinical operation ability, independent learning ability, and teamwork ability were higher than those of the group that simply adopted the PBL teaching method. The results of the satisfaction survey of the experimental group showed that more than 90% of the students believed that the flipped classroom combined with PBL teaching method could assist in the understanding of theoretical knowledge, improve clinical operation ability, enhance independent learning ability and teamwork ability; 92% of the students supported the use of the flipped classroom combined with PBL teaching in the teaching of the respiratory intensive care unit nursing. This shows that the flipped classroom combined with PBL teaching method is worth further promotion in intensive care unit nursing.

## Disclosure statement

The authors declare no conflict of interest.

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